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PREPARATION OF FRESH EASTERN OYSTERS FOR MARKET 1/

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INTRODUCTION

The eastern oyster (Ostrea virginica) is widely distributed in our coastal waters and bays from Massachusetts to Texas. Single specimens still can be found in Maine, but oyster beds which existed there at the time the first colonists settled in New England have long ago disappeared. Although this oyster grows best in brackish waters, it will tolerate for short periods of time both those having a very low salt content and those with a salinity approaching that of ocean water.

Spawning takes place when the water temperature rises to 65° to 68°F., or higher. This limits the spawning time on the New England coast to a period of about two months in the summer. In the warmer areas to the South, however, spawning occurs over a greater span of time -- lasting several months, for example, in the South Atlantic and Gulf waters. The newly emerged young are microscopic in size and are at first free-swimming. After a period of about a fortnight, the young oysters settle to the bottom; and those which come into contact with a firm or hard object soon attach themselves to it and remain there throughout their lives, unless detached. Those which fall into the mud or onto an unclean or muddy surface perish.

1/ Supersedes Memorandum S-193, issued by the former Bureau of Fisheries.

After a period of growth ranging from two to five years, the oysters reach marketable size and are then ready to be harvested. The minimum length of the shell of oysters permitted to be taken commercially for marketing varies, but is usually not less than three inches. Oysters with shells more than six inches in length are generally not used commercially.

OYSTER INDUSTRY

The origin of the oyster industry is lost in antiquity, but undoubtedly goes back to the use of these shellfish as food by primitive peoples. It is known that many centuries ago the Romans were large consumers of oysters and that these people played an important role in the development of the industry. It is known, also, that the oyster was highly regarded as an article of food by the North American Indians; large mounds of oyster shells left by them may be found along our east coast; one of them in Maine has been estimated to contain about 7,000,000 bushels of shells. The early American colonists were quick to realize the possibilities of using, as an important source of food, the vast quantities of oysters then available.

Although the cultivation of oysters has been practiced for centuries in other countries, it is only within comparatively recent times that it has come into extensive use in this country. Practically the entire oyster industry of Long Island and New England is now based on a "farming" procedure. Oyster farming is pursued to a limited extent in Delaware and Chesapeake Bays also, and along the Gulf coast, particularly in Louisiana.

Broadly, the subject of oyster culture may be divided into: (1) the growing of young oysters or spat for use as seed oysters; (2) the planting or distribution of the seed oysters; and (3) the transplanting and care of the growing oysters until they reach marketable size.

Seed oysters are generally grown in certain areas and waters which favor the spawning and setting of the larvae. After attaining a length of about an inch, they are taken up and transplanted to waters and beds more favorable for their growth and for the production of oysters of distinctive flavor.

For the farming, or cultivation, of the eastern oyster, bodies of water suitable for growing oysters are controlled or leased by the producer. Oyster farms may be only a few acres in size, or may extend over several hundred acres. In the northern areas, oyster bottoms may be located in water 30 feet or more deep; in the South, they are often found in shallower water or on flats between the high and low water marks. A clean, hard bottom is highly desirable, and this is often prepared by distributing oyster shells or other firm objects over the beds. In northern waters, an average of about 250 bushels of seed oysters are planted per acre. This quantity is subject to great variation, however,

depending among other things on whether the oysters are later to be transplanted. The oysters may be taken up three or four times during their growing period, and often are transferred to other beds. Clusters are usually broken apart in order that the oysters may have sufficient space for growth and will not be mis-shapen.

A continuous battle must be waged against such oyster enemies as starfish and drills, which destroy large quantities of oysters. It is estimated that starfish alone cause a yearly loss of about $500,000 to the industry in Long Island Sound. Starfish are controlled to some extent by dragging large cotton mops over the beds, entangling the starfish, after which they are brought to the deck of the boat and killed by immersion in hot water. Chemicals are also used, lime being spread over the beds to kill the starfish.

Oyster drills are controlled principally by dredging, trapping, and screening. The dredge is a metal cage about 40 inches wide and 12 inches high, fitted with an inclined screen through which the drills can pass. When the dredge is dragged over the oyster bed, both oysters and drills are moved up over the inclined screen. The drills fall into the cage below, while the oysters are carried over the edge and drop back onto the bed. The trap commonly used is a bag about 12 inches high and 18 inches long, constructed of one-inch mesh chicken wire and filled with small oysters. After being in the water for several days, the bag is lifted and drills are shaken out and destroyed. Drills are also controlled by screening commercially caught oysters on the decks of the oyster boats. In addition to these natural enemies, other hazards confront the grower of oysters; mud and silt may be deposited over the beds; spring freshets may decrease the salt content of the water to a dangerous degree; hurricanes may destroy whole beds; and in shallow waters ice cakes by tide action may carry them away.

METHODS OF TAKING OYSTERS

The principal methods for taking oysters from the beds are by dredging and tonging. The dredge consists of a metal frame with teeth along the lower front edge, to which is attached a bag made of chains or rope for holding the oysters. These dredges are dragged along the bed by power or sail boats. A dredge may gather up to a thousand or more bushels a day. Several dredges may be operated from a single boat, from which they are lowered into the water and hoisted by means of power-operated winches.

Tongs consist of two long poles, crossed in scissor fashion, ranging in length from about 12 to 20 feet, with an iron rake about three feet long at the end of each pole, arranged so as to form a basket when brought together. They are handled by one man who, alternately opening and closing the tongs, scrapes the oysters into the basket. Tongs are usually operated from skiffs or medium-sized motor boats which are generally anchored at both ends. A good day's catch may amount to 25 bushels or more, depending on the density of

the oyster population in the beds. Oysters taken from public beds must be culled and the undersized ones returned to the water.

The eastern oyster supports an industry of varying importance from Massachusetts to Texas. With the exception of the very small plants catering only to local trade, oyster shucking houses are so situated that wharf space is provided for unloading the boats. Tubs or buckets are generally used for hoisting the shell oysters from the boats, although conveyors are employed for this purpose in some plants. In the South, oysters are often brought from the boats in bags.

SHELL OYSTERS

Oysters marketed in the shell and to be eaten "on the half shell" are usually sold for restaurant and hotel trade. Many types of shell oysters have acquired trade names, taken from the names of the beds or locations where they are grown. Those names, however, are often used to signify their shape and size, regardless of the beds from which they come.

For this type of trade, the shells should be clean, well shaped, not in clusters, and fairly uniform in size. In its preparation, the selected shell stock is first sorted to size. It may then be washed, although this stock often comes from sandy beds and is usually relatively clean. In some plants the shell stock may be held for several days in chlorinated sea water in large tanks within the building. It is claimed that this practice eliminates sand from inside the shells and prolongs the life of the oysters after shipping.

Shell oysters are often separated into four or five grades or sizes, varying in count as follows:

Trade size	Oysters per barrel
Box	500
Medium	650-750
Half-shell	900-1,000
Small	1,200

Shell oysters are generally shipped in barrels holding $2\frac{1}{2}$ to 3 bushels; but are shipped also in baskets holding only one bushel and smaller barrels and boxes.

No ice is placed in the shipping containers. Burlap or cloth covers are generally used for closing the barrels. Shipment may be made by railway express or by truck, with refrigeration in transit sometimes provided.

SHUCKED OYSTERS

For the Atlantic and Gulf coastal regions, the location of the shucked oyster industry may be divided arbitrarily into three areas, within which the methods of handling oysters are quite similar. In the area to the south of Virginia, and along the coast to Louisiana, most of the plants are comparatively small. The shell stock is brought to the shuckers either in wheelbarrows or in bags, in many cases, directly from the wharf. Separate rooms for storing the shell stock may or may not be provided. It is generally the practice to pile the shell stock on the shucking table or on a low platform in front of each shucker. The empty shells are usually dropped to the floor, or into large metal containers, and are removed by wheelbarrow. In small plants in the rural areas along the Gulf coast, on the other hand, the shells are tossed out through the open front, or "shell doors," of the shucking house.

The shucked oysters produced in the South Atlantic and Gulf areas are sold mostly within the State or in neighboring States within a radius of about 300 miles. In some instances, plants in the larger cities market almost their entire product locally.

Virginia, Maryland, and New Jersey form a second area. Here, large volumes of shell stock and shucked oysters are handled. The shell stock is usually stored in a large room conveyed to the unloading wharves, carried into the shucking room by wheelbarrow, then shoveled onto the bench in front of each shucker. The shells are usually dropped to the floor and later removed in wheelbarrows to the shell pile. The bulk of the oysters packed in these States is shipped out of the area and sold in the eastern half of the country.

In the third area, which includes New York, Connecticut, and Rhode Island, it is the general practice to store the shell stock in large bins filled from the floor above and extending along the entire back of the shucking tables. The shell oysters are taken from an opening near the bottom of the bin in front of each shucker, and the empty shells are dropped through a hole in the shucking table. From here they pass down a chute to containers in a room back of the shucking table or onto a conveyor system which carries them directly to the shell pile. The use of conveyors in unloading boats, and in all handling procedures, is common.

SHUCKING

Oysters are opened or shucked by holding them flat in one hand, usually the left, and with the other hand forcing a specially made knife between the shells at the side or at the thin end. Many shuckers prefer to crack the thin ends or "bills" with a hammer, thus making it easier to insert the knife. The large adductor muscle attached to one shell is

then cut and the shell removed. The other end of the same muscle holding the opposite shell is likewise cut and the oyster meat dropped into a container. The shuckers generally stand at benches, although in some plants in the deep South they sit on low stools and have the shucking buckets on the floor in front of them. An average day's shucking may be about 10 gallons, although this is subject to great variation due to the size and fatness of the oysters, and the length of the working day. The number of shuckers in any one plant varies from as few as a half-dozen to 200 or more. Both men and women are employed.

In New England and Long Island, the oysters are generally shucked into perforated containers, allowing the liquor to drain off as it is formed. In other areas, it is customary to shuck the meats into a tight container partly filled with water. The size of the container varies: from Virginia, northward, for example, a gallon or nine-pint can is usually used; south of Virginia and along the Gulf coast, cans holding one and two gallons, or pails with sloping sides and holding 9 or 12 quarts are used. The containers are made of galvanized iron, corrosion-resistant metal, or aluminum.

SORTING

Different methods are used to sort out the desired sizes of meats. In New England and Long Island, oysters of mixed sizes are generally shucked into one container and are then sorted by hand or, in some instances, by machine, after being washed and "blown" (see below). In New Jersey, each shucker may use five or even six, separate containers for sorting that many sizes during shucking. In the great majority of plants in the Maryland-Virginia area and in North and South Carolina, two or three sizes are sorted by the shuckers. In most plants of the Gulf coast section, the shucked meats are not sorted because only mixed sizes are sold.

When the containers are filled, they are taken to the measuring window by the shucker and the quantity of oysters measured. The shucker then receives "credit," either by a ticket or token, or more often by scores marked on a board at the measuring window. Payment on the basis of piece work is made at a later time.

WASHING AND BLOWING

The oyster meats are then drained on a washing or skimming table, and given a light wash with fresh water from a spray nozzle. The washing tables vary in size, but average about 2½ feet wide by 5 feet long. They are made either of galvanized iron or corrosion-resistant metal, and are perforated to permit drainage of the water. This step permits the operator to cull out pieces of shell, oyster crabs, and mutilated and badly discolored oysters. This is the extent of exposure to fresh water in most of the plants from North Carolina to Texas.

In the areas from Virginia northward, it is the practice to blow all shucked oysters after coming from the skimming table. Washing may be

a separate step, in which the oysters are stirred about with a paddle or dipper in a tank of water before being put into the blowing tank. The more common practice is to wash and blow in the same tank, the oysters generally being held in the tank of water until enough have accumulated for blowing. In several plants the shucked oysters may be held in large cans without water until about 30 gallons have accumulated, after which they are blown.

The oysters are blown in a galvanized iron or corrosion-resistant metal tank three to four feet in diameter, having a conical-shaped bottom, with a valve at the lowest point for draining the water. The tank is provided with a perforated, removable false bottom, below which runs a perforated pipe. Air, forced through this pipe, violently agitates the mass of oysters and water. The length of the blowing period varies greatly; a tentative limit of three minutes has been set by some States, but 10 to 15 minutes is frequently noted. It is the practice in some plants to circulate water through the blowing tank and out an overflow during part of the time the air is being passed through. After blowing, the oysters are transferred to the skimming table to drain before being packed.

GRADING

Shucked oysters are usually packed according to grades or sizes. In North and South Carolina two grades, Standards and Selects, are generally prepared. From Virginia northward, several grades may be packed, such as Standards, Selects, Extra Selects, and Counts. In addition, other specially designated intermediate grades may be produced. The number of oyster meats in a gallon for the various grades varies widely as no standard of grades has been established. A typical arbitrary grading is as follows:

Grade	Oysters per gallon
Counts	150-200
Extra Selects	200-225
Selects	225-300
Standards	300-325

The number of oysters in the Standard size, however, often runs as high as 500 or more per gallon.

PACKING

Eastern oysters are packed in tin cans varying in size from 1/2 pint to 20 gallons, although the 5-gallon size is the largest in general use. The one-gallon size is the most popular. No liquor other than that remaining on the oysters after they are drained is included in the container.

Plug-top cans are widely used for packaging oysters, although consumer or tamper-proof cans, which require special sealing equipment for closing the covers, are employed to a limited extent. The State license number of the shucking house must appear on the cans. In shipping, the cans of shucked oysters are usually packed in barrels with crushed ice. The larger barrels hold 20 gallons of oysters but smaller size barrels and boxes also are used. Large shipments are sometimes made by stacking the cans individually in trucks or cars that are provided with refrigeration.

MEATS IN BUSHEL

The yield of oyster meats per U. S. standard bushel varies widely from year to year and for different beds. Taking the beds as a whole for each State, however, the yield for a typical year will run somewhat as follows:

Area	Pounds of meat per standard bushel of shell oysters
Gulf States	3.5 - 4.5
South Atlantic States	3.0
Virginia and Maryland	4.5
Delaware to Massachusetts	6.7 - 7.5